Soaring With Eagles

Grade: 7-12

This lesson is designed for 7-12 grades. This lesson is a project by participants of a summer workshop at the Grant-Kohrs Ranch.

Cheryl

Science standards:

Content Standard 1 – Students design, conduct, evaluate and communicate scientific investigations.

Content Standard 2 – Students demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.

Content Standard 3 – Students demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

Content Standard 4 – Students demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.

Subjects: Science, English, Art and Math

Duration: 5 class periods

Materials: paper/ pencils

Ruler or graph paper

Calculator

Background:

Many bird experts have identified four types of flight found in birds. These four types are ***flapping, soaring***, ***gliding and hovering.***. As the names indicate, these types of flight are different in the number of times that the bird moves the wings up and down during flight. A flapping bird moves its wings up and down in a repeated pattern with little time between beats. Most perching birds are flappers. These include robins, starlings and other common birds. A soaring bird uses its wings only occasionally with several minutes between beats. Soaring birds are also champions at using thermals to travel up and down within air columns, rising with warm air and descending with cold air. Many of these birds are birds of prey such as eagles, hawks and vultures. Gliding birds rarely flap their wings except when taking off or landing. Many sea birds such as albatrosses fit in this category. These birds spend hours riding currents of air without a single wing beat. Hovering birds are represented by the hummingbirds and a few others . Time between wing beats

for these birds is measured in milliseconds and instead of the up and down wing pattern of most birds, these birds use a modified figure 8 pattern.

Using the pictures of the identified flying birds, measure the length of one wing from the middle of the wing next to the body to the longest tip furthest from the body.. Measure the width of the wing at its widest part. Calculate the ratio of the length compared to the width by dividing. Record your answers.

Bird ratio = $\frac{\text{length of wing}}{\text{Width of wing}}$ This ratio is called the aspect ratio.

Length of wing	**Width of wing**	**Aspect ratio = length/width**	**Weight**	**Aspect ratio/ weight**
flapping				
soaring				
gliding				
hovering				
flightless				

Gliding birds have a greater value for this ratio than soaring birds. Hovering birds have the smallest ratio. Using these ratio values, determine what type of flight each or the birds use represented by the pictures.

Besides wings, birds have other adaptations that allow them to fly. Name 5 of these and explain how they help a bird to fly.

1.

2.

3.

4.

5

If humans had the same body structures and weight as birds, what type of bird would we be? How could you prove this?

There are flightless birds such as ostriches, rheas, emus and cassowaries.
Give some reasons why these birds cannot fly using the facts given above.

Penguins also cannot fly. What characteristics prove this fact?

How could you use the wing aspect ratio and body weight to determine what birds cannot fly? Humans cannot fly like birds. Why not?

Take the aspect ratios calculated above and divide them by the weight of the birds. Make a general statement relating aspect ratio to body weight.

Modifications: (Teacher note:)

For students that have difficulties measuring with a ruler, graph paper can be substituted. Paste a flying bird picture cut out accurately around the body to the graph paper. Students can count the number of squares using whole numbers to get the ratios that will be used for this activity. Estimation skills can be used to measure partial squares if you like. I have found it easier to measure metrically to avoid problems with fractions. Rounding to the nearest 100^{th} should work well on ratios. Bird pictures can be obtained from www.gobirdmontana.com Bird weights can be found in most field guides and at the following web site http://www.birds.cornel.edu/AllAboutBirdGuide.

Measure the width of the wing at its widest part. Measure the length of the wing from the middle of the body to the farthest point.

Enrichment:

1. If a tame live chicken can be obtained. Measure a real bird. This adds a major interest factor. Chickens are not good flyers and their wing measurements prove this.

2.)Draw a sketch of an imaginary bird that represents each type of flight. Accurately use length and width of the wings. Give each bird a scientific Latin name for genus and species and explain why each bird was given that name.

3. Construct a paper airplane that has the same ratio as one of the birds and fly it. Write a descriptive paragraph about the flight pattern of the bird and the paper airplane.